UNIVERSITY AT ALBANY
STATE UNIVERSITY OF NEW YORK

AMAT100 PreCalculus Exam 3A Spring 2025

Print Name:

UAlbany Email:

Directions: You have **80 minutes** to answer the following questions. ***You must show all necessary work*** as neatly and clearly as possible. Clearly indicate your final answers by placing a box or circle around it.

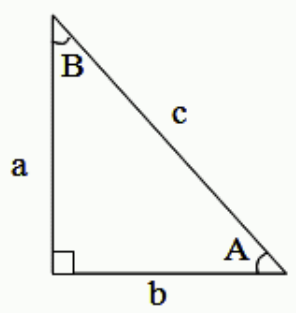
No calculators, notes, textbooks, mobile phones or other aids are allowed. Do not detach pages.

Problem	Possible	Points
1	16	
2	12	
3	12	
4	12	
5**	6	
Total	52	

**Optional Extra Credit Problems

(Similar to Practice Problems 14)

(1) (a) (6 Points) Consider the triangle below (Triangle not drawn to scale).
Suppose $a = 4$ and $b = 7$. Find the exact values for each of the trig functions below.



(i) $\sin(A) =$ _____,

(ii) $\cos(A) =$ _____,

(iii) $\tan(A) =$ _____.

(b) (10 Points) If $\cos(\theta) = -\frac{3}{8}$ and θ is in the 3rd quadrant, then the exact value of

(i) $\sin(\theta) =$ _____.

(ii) $\tan(\theta) =$ _____.

(iii) $\sec(\theta) =$ _____.

(iv) $\csc(\theta) =$ _____.

(v) $\cot(\theta) =$ _____.

(Similar to Practice Problems 14)

(2) (a) (6 Points) If $\theta = \dfrac{5\pi}{6}$, then

(i) $\sin(\theta) =$ _____,

(ii) $\cos(\theta) =$ _____.

(b) (6 Points) A person standing 200 feet from the base of a tree observes that the angle of elevation to the top of the tree is $60°$. How tall is the tree?

(*Simplify your final answer and evaluate all trigonometric functions.*)

(Similar to Practice Problems 15 and Homework 10)

(3) The number of hours of daylight, D, in a particular city can be modeled by the function

$$D(t) = 12 + 2.5 \sin\left(\frac{\pi}{6}(t-3)\right),$$

where t is the time in months, with $t = 1$ representing January, $t = 2$ representing February, and so on. You do not need to show work.

(a) (2 Points Each) Fill in the blanks. State the period, amplitude, and midline of the function D.

(i) The period of $D(t)$ is _____ months.

(ii) The amplitude of $D(t)$ is _____ hours.

(iii) The equation of the midline of $D(t)$ is _____ .

(b) (3 Points Each)

(i) What is the maximum number of daylight hours in this city according to the model? _____ hours.

(ii) What is the number of daylight hours in September ($t = 9$) according to the model? _____ hours.

(Similar to Practice Problems 15 and Homework 11)

(4) (a) (3 Points) Evaluate $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ and express your answer in radians.

(b) (3 Points) Evaluate $\arctan(1)$ and express your answer in degrees.

(c) (6 Points) Find the exact value of

$$\tan\left(\sin^{-1}\left(-\frac{1}{3}\right)\right)$$

(Optional Extra Credit Problem: 6 Points)

(5) Use the trigonometric identity

$$\sin(\theta + \phi) = \sin(\theta)\cos(\phi) + \sin(\phi)\cos(\theta)$$

to find the exact value of

$$\sin\left(\tan^{-1}\left(\frac{1}{5}\right) + \cos^{-1}\left(\frac{3}{7}\right)\right).$$

Show all your work.